What is claimed is:

1. A multilevel value output device, comprising:

a relative density value storage portion that prestores therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined dependently on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values;

an input portion that receives an input value indicative of density of a pixel in an input image;

a corrected value calculation portion that calculates a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

an output value generation portion that compares the corrected value with at least one of the at least two threshold values, that converts the corrected value into one of the at least three multilevel values based on the compared results, and that outputs a resultant multilevel output value, the output value generation portion referring to the threshold value storage portion and setting one relative density value that corresponds to the output value, the output value generation portion calculating a difference

between the corrected value and the relative density value and setting the calculated result as an error value for the subject pixel; and

an output-value generation control portion that, when the corrected value is close to each of at least one of the at least three relative density values, reduces a frequency, at which the output value generation portion converts the corrected value into one multilevel output value that corresponds to the subject relative density value, thereby reducing a frequency at which the error value for the subject pixel becomes close to zero.

2. A multilevel value output device as claimed in claim 1,

wherein the output-value generation control portion includes:

a corrected-value judging portion judging whether or not the corrected value is close to any of the at least one of the at least three relative density values; and

a selective control portion that controls, when the corrected value is not close to any of the at least one of relative density value, the output value generation portion to convert the corrected value into one multilevel output value based on the compared results, the selective control portion controlling, when the corrected value is close to one of the at least one relative density value, the output

value generation portion to fail to convert the corrected value into the one multilevel output value that corresponds to the subject relative density value, thereby preventing the output value generation portion from calculating the error value for the subject pixel as being close to zero.

3. A multilevel value output device as claimed in claim 2,

wherein when the corrected value is close to one of the at least one relative density value, the selective control portion controls the output value generation portion to convert the corrected value into a multilevel output value other than the one multilevel output value that corresponds to the subject relative density value.

4. A multilevel value output device as claimed in claim 1,

wherein the output-value generation control portion further includes:

a random number generating portion generating a random number when the corrected value calculation portion calculates the corrected value for the subject pixel; and

a random number judging portion judging whether or not the random number is equal to a predetermined number,

wherein when the random number is equal to the predetermined number, the corrected-value judging portion executes its judging operation and the selective control

portion executes its selective control operation, and when the random number is not equal to the predetermined number, the corrected-value judging portion fails to execute its judging operation and the selective control portion controls the output value generation portion to convert the corrected value into one multilevel output value based on the compared results.

5. A multilevel value output device as claimed in claim 2,

wherein the output-value generation portion includes a threshold setting portion that sets the at least two threshold values in a manner that the at least two threshold values are maintained as being fixed regardless of changes of the input value.

6. A multilevel value output device as claimed in claim 1,

wherein the output value generation portion converts the corrected value into each of at least one multilevel output value that corresponds to the at least one relative density value when the corrected value is between the at least two threshold values,

wherein the output-value generation control portion includes a threshold setting portion that sets, upon receipt of the input value, the at least two threshold values in a manner that the at least two threshold values become close

to each other when the input value becomes close to the at least one relative density value.

7. A multilevel value output device as claimed in claim 6,

wherein the at least two threshold values include a higher threshold value and a lower threshold value that is lower than the threshold value,

8. A multilevel value output device as claimed in claim 7,

wherein the threshold setting portion sets the higher threshold value and the lower threshold value in a manner that as the input value decreases in a higher range defined between the at least one relative density value and another relative density value that is higher than the subject relative density value toward the at least one relative density value, the lower threshold value is maintained as fixed and the higher threshold value decreases smoothly toward the lower threshold value.

9. A multilevel value output device as claimed in claim 8,

wherein the lower threshold value is maintained as fixed to an intermediate value between the at least one relative density value and still another relative density value lower than the at least one relative density value.

10. A multilevel value output device as claimed in

claim 7,

wherein the threshold setting portion sets the higher threshold value and the lower threshold value in a manner that as the input value increases in a lower range defined between the at least one relative density value and another relative density value that is lower than the subject relative density value toward the at least one relative density value, the higher threshold value is maintained as fixed and the lower threshold value increases smoothly toward the higher threshold value.

11. A multilevel value output device as claimed in claim 10,

wherein the higher threshold value is maintained as fixed to an intermediate value between the at least one relative density value and still another relative density value higher than the at least one relative density value.

12. A multilevel value output device as claimed in claim 6,

wherein the at least three multilevel output values include a highest multilevel output value, a second highest multilevel output value lower than the highest multilevel output value, a third highest multilevel output value lower than the second highest multilevel output value, and a lowest multilevel output value lower than the third highest multilevel output value, and

wherein the at least three relative density values include a highest relative density value, a second highest relative density value lower than the highest relative density value, a third highest relative density value lower than the second highest relative density value, and a lowest relative density value lower than the third highest relative density value, the relative density value storage portion storing the highest, second highest, third highest, and fourth highest relative density values in one-to-one correspondence with the highest, second highest, third highest, and lowest multilevel output values, respectively,

wherein the threshold setting portion sets three threshold values that include a highest threshold value, a second highest threshold value lower than or equal to the highest threshold value, and a lowest threshold value lower than or equal to the second highest threshold value,

wherein the output value generation portion outputs the highest multilevel output value when the corrected value is greater than the highest threshold value, outputs the second highest multilevel output value when the corrected value is between the highest threshold value and the second highest threshold value, outputs the third highest multilevel output value when the corrected value is between the second highest threshold value and the third highest threshold value, and outputs the lowest multilevel output

value when the corrected value is smaller than the lowest threshold value, and

wherein the threshold setting portion sets the highest threshold value and the second highest threshold value in a manner that the highest threshold value and the second highest threshold value become close to each other when the input value becomes close to the second highest relative density value, and sets the second highest threshold value and the third highest threshold value in a manner that the second highest threshold value and the third highest threshold value become close to each other when the input value becomes close to the third highest relative density value.

13. A multilevel value output device as claimed in claim 12,

wherein the threshold setting portion sets the highest, second highest, and third highest threshold values in a manner that

as the input value decreases in a highest range defined between the highest relative density value and the second highest relative density value from the highest relative density value toward the second highest relative density value, the highest threshold value decreases smoothly from the highest relative density toward a higher intermediate value between the second highest relative

density value and the third highest relative density value, the second highest threshold value is maintained as fixed to the higher intermediate value, and the third highest threshold value is maintained as fixed to a lower intermediate value between the third highest relative density value and the lowest relative density value,

as the input value decreases in a second highest range defined between the second highest relative density value and the third highest relative density value from the second highest relative density value toward the third highest relative density value, the highest threshold value is maintained as fixed to the higher intermediate value, the second highest threshold value decreases smoothly from the higher intermediate value toward the lower intermediate value, and the third highest threshold value is maintained as fixed to the lower intermediate value,

as the input value decreases in a third highest range defined between the third highest relative density value and the lowest relative density value from the third highest relative density value toward the lowest relative density value, the highest threshold value is maintained as fixed to the higher intermediate value, the second highest threshold value is maintained as fixed to the lower intermediate value, the third highest threshold value decreases smoothly from the lower intermediate value toward the lowest relative

density value, and

as the input value changes in a lowest range defined smaller than or equal to the lowest relative density value, the highest threshold value is maintained as fixed to the higher intermediate value, the second highest threshold value is maintained as fixed to the lower intermediate value, and the third highest threshold value is maintained as fixed to the lowest relative density value.

14. A multilevel value output device, comprising:

a relative density value storage portion that prestores therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined by normalizing the at least three multilevel output values based on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the at least three relative density values including a middle relative density value, a higher relative density value higher than the middle relative density value, and a lower relative density value lower than the middle relative density value, the at least three multilevel output values including a middle multilevel output value, a higher multilevel output value higher than the middle multilevel output value, and a lower multilevel output value lower than

the middle multilevel output value, the higher, middle, and lower relative density values corresponding to the higher, middle, and lower multilevel output values, respectively;

an input portion that receives an input value indicative of density of a pixel in an input image;

a corrected value calculation portion that calculates a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

an output value generation portion that compares the corrected value with at least one of the at least two threshold values, the at least two threshold values including a higher threshold value and a lower threshold value that is lower than the higher threshold value, the output value generation portion converting the corrected value into one of the at least three multilevel values based on the compared results and outputting the resultant one multilevel output value, the output value generation portion converting the corrected value into the higher multilevel output value when the corrected value is greater than the higher threshold value, the output value generation portion converting the corrected value into the middle multilevel output value when the corrected value is between the higher threshold value and the lower threshold value, the output value generation portion converting the corrected value into

the lower multilevel output value when the corrected value is smaller than the lower threshold value;

a relative density setting portion that refers to the threshold value storage portion and that sets one relative density value that corresponds to the multilevel output value generated by the output value generation portion;

an error value calculation portion that calculates a difference between the corrected value and the relative density value set by the relative density setting portion, and that sets the calculated result as an error value for the subject pixel; and

a threshold setting portion that sets, upon receipt of the input value, the higher and lower threshold values in a manner that the higher and lower threshold values become close to each other when the input value becomes close to the middle relative density value.

15. A multilevel value output device as claimed in claim 14,

wherein the threshold setting portion sets the higher and lower threshold values in a manner that as the input value decreases from the higher relative density value toward the middle relative density value, the lower threshold value is maintained fixed while the higher threshold value decreases smoothly toward the lower threshold value.

16. A multilevel value output device as claimed in claim 15,

wherein the threshold setting portion sets the higher and lower threshold values in a manner that as the input value decreases from the higher relative density value toward the middle relative density value, the lower threshold value is maintained fixed to an intermediate value between the middle relative density value and the lower relative density value while the higher threshold value decreases smoothly toward the intermediate value.

17. A multilevel value output device as claimed in claim 14,

wherein the threshold setting portion sets the higher and lower threshold values in a manner that as the input value increases from the lower relative density value toward the middle relative density value, the higher threshold value is maintained fixed while the lower threshold value increases smoothly toward the higher threshold value.

18. A multilevel value output device as claimed in claim 17,

wherein the threshold setting portion sets the higher and lower threshold values in a manner that as the input value increases from the lower relative density value toward the middle relative density value, the higher threshold value is maintained fixed to an intermediate value between

the middle relative density value and the lower relative density value while the lower threshold value increases smoothly toward the intermediate value.

19. A multilevel value output method using a relative density value storage portion that prestores therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined dependently on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the method comprising:

receiving an input value indicative of density of a pixel in an input image;

calculating a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

comparing the corrected value with at least one of the at least two threshold values, converting the corrected value into one of the at least three multilevel values based on the compared results, outputting a resultant multilevel output value, referring to the threshold value storage portion, setting one relative density value that corresponds to the output value, calculating a difference between the corrected value and the relative density value, and setting

the calculated result as an error value for the subject pixel; and

reducing, when the corrected value is close to each of at least one of the at least three relative density values, a frequency, at which the corrected value is converted into one multilevel output value that corresponds to the subject relative density value, thereby reducing a frequency at which the error value for the subject pixel becomes close to zero.

20. A multilevel value output method using a relative density value storage portion that prestores therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined by normalizing the at least three multilevel output values based on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the at least three relative density values including a middle relative density value, a higher relative density value higher than the middle relative density value, and a lower relative density value lower than the middle relative density value, the at least three multilevel output values including a middle multilevel output value, a higher multilevel output value higher than the middle multilevel output value, and a lower

multilevel output value lower than the middle multilevel output value, the higher, middle, and lower relative density values corresponding to the higher, middle, and lower multilevel output values, respectively, the method comprising:

receiving an input value indicative of density of a pixel in an input image;

calculating a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

comparing the corrected value with at least one of the at least two threshold values, the at least two threshold values including a higher threshold value and a lower threshold value that is lower than the higher threshold value, thereby converting the corrected value into one of the at least three multilevel values based on the compared results and outputting the resultant one multilevel output value, the comparing step converting the corrected value into the higher multilevel output value when the corrected value is greater than the higher threshold value, the comparing step converting the corrected value into the middle multilevel output value when the corrected value is between the higher threshold value and the lower threshold value, the comparing step converting the corrected value into the lower multilevel output value when the corrected

value is smaller than the lower threshold value;

referring to the threshold value storage portion and setting one relative density value that corresponds to the multilevel output value generated;

calculating a difference between the corrected value and the set relative density value, and setting the calculated result as an error value for the subject pixel; and

setting, upon receipt of the input value, the higher and lower threshold values in a manner that the higher and lower threshold values become close to each other when the input value becomes close to the middle relative density value.

21. A multilevel value output program to be executed by a computer that has a relative density value storage portion storing therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined dependently on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the program comprising:

a program receiving an input value indicative of density of a pixel in an input image;

a program calculating a corrected value by adding to

the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

a program comparing the corrected value with at least one of the at least two threshold values, converting the corrected value into one of the at least three multilevel values based on the compared results, outputting a resultant multilevel output value, referring to the threshold value storage portion, setting one relative density value that corresponds to the output value, calculating a difference between the corrected value and the relative density value, and setting the calculated result as an error value for the subject pixel; and

a program reducing, when the corrected value is close to each of at least one of the at least three relative density values, a frequency, at which the corrected value is converted into one multilevel output value that corresponds to the subject relative density value, thereby reducing a frequency at which the error value for the subject pixel becomes close to zero.

22. A recording medium storing a multilevel value output program and readable by a computer that has a relative density value storage portion storing therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with

each other, the at least three relative density values being defined dependently on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the multilevel value output program comprising:

a program receiving an input value indicative of density of a pixel in an input image;

a program calculating a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

a program comparing the corrected value with at least one of the at least two threshold values, converting the corrected value into one of the at least three multilevel values based on the compared results, outputting a resultant multilevel output value, referring to the threshold value storage portion, setting one relative density value that corresponds to the output value, calculating a difference between the corrected value and the relative density value, and setting the calculated result as an error value for the subject pixel; and

a program reducing, when the corrected value is close to each of at least one of the at least three relative density values, a frequency, at which the corrected value is converted into one multilevel output value that corresponds

to the subject relative density value, thereby reducing a frequency at which the error value for the subject pixel becomes close to zero.

23. A multilevel value output program to be executed by a computer that has a relative density value storage portion storing therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined by normalizing the at least three multilevel output values based on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the at least three relative density values including a middle relative density value, a higher relative density value higher than the middle relative density value, and a lower relative density value lower than the middle relative density value, the at least three multilevel output values including a middle multilevel output value, a higher multilevel output value higher than the middle multilevel output value, and a lower multilevel output value lower than the middle multilevel output value, the higher, middle, and lower relative density values corresponding to the higher, middle, and lower multilevel output values, respectively, the program comprising:

a program of receiving an input value indicative of

density of a pixel in an input image;

a program of calculating a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

a program of comparing the corrected value with at least one of the at least two threshold values, the at least two threshold values including a higher threshold value and a lower threshold value that is lower than the higher threshold value, thereby converting the corrected value into one of the at least three multilevel values based on the compared results and outputting the resultant one multilevel output value, the comparing program converting the corrected value into the higher multilevel output value when the corrected value is greater than the higher threshold value, the comparing program converting the corrected value into the middle multilevel output value when the corrected value is between the higher threshold value and the lower threshold value, the comparing program converting the corrected value into the lower multilevel output value when the corrected value is smaller than the lower threshold value;

a program of referring to the threshold value storage portion and setting one relative density value that corresponds to the multilevel output value generated;

a program of calculating a difference between the corrected value and the set relative density value, and setting the calculated result as an error value for the subject pixel; and

a program of setting, upon receipt of the input value, the higher and lower threshold values in a manner that the higher and lower threshold values become close to each other when the input value becomes close to the middle relative density value.

24. A recording medium storing a multilevel value output program and readable by a computer that has a relative density value storage portion storing therein at least three relative density values for at least three multilevel output values in one-to-one correspondence with each other, the at least three relative density values being defined by normalizing the at least three multilevel output values based on a predetermined maximum density that is defined for a highest relative density value among the at least three relative density values, the at least three relative density values including a middle relative density value, a higher relative density value higher than the middle relative density value, and a lower relative density value lower than the middle relative density value, the at least three multilevel output values including a middle multilevel output value, a higher multilevel output value

higher than the middle multilevel output value, and a lower multilevel output value lower than the middle multilevel output value, the higher, middle, and lower relative density values corresponding to the higher, middle, and lower multilevel output values, respectively, the program comprising:

a program of receiving an input value indicative of density of a pixel in an input image;

a program of calculating a corrected value by adding to the input value at least a part of an error value that has been generated by at least one pixel near to the subject pixel;

a program of comparing the corrected value with at least one of the at least two threshold values, the at least two threshold values including a higher threshold value and a lower threshold value that is lower than the higher threshold value, thereby converting the corrected value into one of the at least three multilevel values based on the compared results and outputting the resultant one multilevel output value, the comparing program converting the corrected value into the higher multilevel output value when the corrected value is greater than the higher threshold value, the comparing program converting the corrected value into the middle multilevel output value when the corrected value is between the higher threshold value and the lower

threshold value, the comparing program converting the corrected value into the lower multilevel output value when the corrected value is smaller than the lower threshold value;

a program of referring to the threshold value storage portion and setting one relative density value that corresponds to the multilevel output value generated;

a program of calculating a difference between the corrected value and the set relative density value, and setting the calculated result as an error value for the subject pixel; and

a program of setting, upon receipt of the input value, the higher and lower threshold values in a manner that the higher and lower threshold values become close to each other when the input value becomes close to the middle relative density value.